THE PREDICTIVE VALIDITY OF FOUR TESTS IN NINTH - GRADE MATHEMATICS AT THE UNION - WHITTEN HIGH SCHOOL

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by

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THE PROBLEM AND PROCEDURE

Educators have long sought a tool by which they might predict with some accuracy the success a student will have in high school academic subjects. Administrators, counselors, and teachers have put to use various types of information to make a valid prediction. The possible use and predictive validity of four standardized tests for this purpose were examined in this study.

I. THE PROBLEM

Statement of the problem. The purpose of this study was (1) to evaluate the California Algebra Aptitude Test, the Differential Aptitude Test, the Iowa Test of Educational Development, and the Otis Quick - Scoring Mental Abilities Test as to which test is the best measure to predict success in ninth - grade mathematics; (2) to check the correlations of these test scores with students' grades at the end of each semester in ninth - grade mathematics in the Union - Whitten Community School, Union, Iowa, for the 1968 - 1969 school year; and (3) to use these results for future placement in ninth - grade mathematics.

Importance of the study. The accurate placement of

ninth - grade students in either Algebra I or General Mathematics has been a goal of the principal and the counselor of the Union - Whitten Community School. Placement on the basis of ability as measured by effective tests should hopefully facilitate the learning process.

An administrator is usually confronted with the immediate placement of students into classes with very little information to rely on in order to perform this task accurately. The records supplied by the elementary schools frequently are not a good basis for prediction of future success due to variations in academic standards, grading systems, and methods of keeping records. Much has been done in the area of predicting college success from high school test results, grade - point averages, and anecdotal records; but little material is available for predicting high school success from information available at the junior high level.

The writer believed that a comparison of the scores from the four aforementioned tests would provide an excellent measure by which to place students in either Algebra I or General Mathematics. Hopefully, a high or low score on one of the tests would be a fairly accurate predictor of success or failure in high school mathematics.

Limitations of the study. The study was limited in that a total of only twenty-nine students was involved. The tests were administered at two different testing centers and

on four different days which may have had an effect on the scores. Another limitation is that the evaluation of the scores is not yet professionally accurate since no local minimum scores for placement have yet been established.

II. PROCEDURE

Procedure. The writer first secured permission to use the cumulative records of the Union - Whitten Community School to provide the grades and test results of the ninth - grade students in the 1968 - 1969 school year. The California Algebra Aptitude Test has been used for two years, the Differential Aptitude Test was introduced in the 1968 - 1969 school year, and the Iowa Test of Educational Development and the Otis Quick - Scoring Mental Abilities Test have been used for fifteen years. The total number of students involved in the study group was 29.

The raw test scores were converted to stanines for the purpose of computing correlation coefficients. The letter grades were converted to numerical values as follows: A = 4, B = 3, C = 2, D = 1, and F = 0. A coefficient of correlation was determined between each of the two subjects (Algebra and General Mathematics) for each semester in the ninth grade and the composite score of the California Algebra Aptitude Test, the Numerical Ability score of the Differential Aptitude Test, the Numerical Ability plus

Verbal Reasoning score of the Differential Aptitude Test, the Quantitative Thinking score of the Iowa Test of Educational Development, and the composite score of the Otis Quick - Scoring Mental Abilities Test - Beta.

The Pearson Product - Moment Formula,[1]

$$r = \frac{N\Sigma dxdy - \Sigma dx \Sigma dy}{\sqrt{N\Sigma d^2x - (\Sigma dx)^2}\ \sqrt{N\Sigma d^2y - (\Sigma dy)^2}}$$

was used to determine the correlations mentioned previously. There are, altogether, twenty correlations included in this study.

The index of forecasting efficiency was used to compute the probable accuracy of prediction for any coefficient of correlation by the use of the formula:[2]

$$E = 100\ (1 - \sqrt{1 - r^2})$$

The index of forecasting efficiency indicates the percentage improvement in predictive ability of a coefficient of correlation over pure chance.

Definition of terms used. The predictive validity of tests has been described as that which is concerned with the relation of test scores to measures on a criterion based on performance at some later time. Thus, as an example of pre-

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[1] Merle W. Tate, Statistics in Education (New York: The Macmillan Company, 1955), p. 238.

[2] Ibid., p. 246.

dictive validity, there may be evidence that scores on a spelling test can help to differentiate between pupils who will succeed and pupils who will fail in a stenography course.[1]

The California Algebra Aptitude Test has been referred to as CAAT in this study. The CAAT is an aptitude test which is designed to detect or predict those students who have the ability to think in quantitative terms for the specific purpose of doing algebraic problems.[2]

The Differential Aptitude Test has been referred to as DAT in this study. There are eight different aptitude tests in the DAT. The Numerical Ability items, hereinafter referred to as NA, are designed to test understanding of numerical relationships and facility in handling numerical concepts. The Numerical Ability items plus the Verbal Reasoning items, hereinafter referred to as NA+VR, are obtained for the prediction of overall academic success.[3]

The Iowa Tests of Educational Development has been referred to as ITED in this study. The ITED is designed to

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[1] Educational Testing Service, Selecting an Achievement Test: Principles and Procedures (Evanston, Illinois: Educational Testing Service, 1961), p. 8.

[2] Noel Keys and Muriel McCrum, California Algebra Aptitude Test - Manual (Minneapolis: American Guidance Service, Inc., 1958), p. 2.

[3] George K. Bennett, Harold G. Seashore and Alexander G. Wesman, Differential Aptitude Tests - Fourth Edition Manual (New York: The Psychological Corporation, 1966), pp. 1-6.

provide a comprehensive and dependable description of the general educational development of high school students and college students. The Quantitative Thinking Test, hereinafter referred to as QT, is one of nine tests in the battery. The ITED QT is a test of general mathematical ability. The importance of general mathematics in adult living is obvious. In our technological culture, general skill in quantitative thinking is almost as necessary as reading.[1]

The Otis Quick - Scoring Mental Ability Tests has been referred to as OQSMAT in this study. The OQSMAT comprise three tests, called Alpha, Beta, and Gamma. The Alpha Test is designed for Grades 1-4, the Beta Test is designed for Grades 4-9, and the Gamma Test is designed for High Schools and Colleges. The purpose of the three tests is to measure mental ability-thinking power or the degree of maturity of the mind. The Beta test of the OQSMAT is the test used in this study.[2]

Algebra I is one of the two ninth - grade mathematics courses taught at Union - Whitten High School. This subject is basic to the pursuit of advanced mathematics and science. It is primarily the study of balance using letters as well as numbers. All basic algebraic skills are presented in

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[1] Paul Blommers, Iowa Tests of Educational Development - Examiner Manual (Chicago: Science Research Associates, Inc., 1951), p. 1.

[2] Arthur S. Otis, Otis Quick - Scoring Mental Ability Tests - Manual (New York: Harcourt, Brace & World, Inc., 1954), p. 1.

detail.[1]

General Mathematics is one of the two ninth - grade courses taught at Union - Whitten High School. This subject is the study of arithmetic, intuitive geometry, algebra of simple formulas and equations, and tangent ratio. This course will meet basic needs for mathematics in everyday living. It is mainly for the student who cannot master Algebra I.[2]

The grading system at Union - Whitten High School consists of these five grades - A, B, C, D, and F. Grade A is excellent, with the percentage ranging from 94 to 100 per cent. Grade B is good, with the percentage ranging from 87 to 93 per cent. Grade C is average, with the percentage ranging from 77 to 86 per cent. Grade D is poor, with the percentage ranging from 70 to 76 per cent. Grade F denotes failure with the percentage ranging from 69 per cent and below.[3]

The writer has stated that the raw scores were converted to stanines which are standard score measures that place a set of scores into a normal distribution curve. The

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[1]Union - Whitten High School, U - W Curriculum Handbook (Union, Iowa: Union - Whitten High School, 1968), p.6.

[2]Ibid.

[3]Union - Whitten High School, U - W Student Handbook 1968-69 (Union, Iowa: Union - Whitten High School, 1968), p. 8.

stanine system is based on a nine - point scale, with the total distribution divided into nine categories. Each category has a width of one-half standard deviation with a mean of five and a standard deviation of two. The stanine scale is constructed so that a stanine of nine is the highest measure and a stanine of one is the lowest.

The Pearson Product - Moment Formula was used to compute a coefficient of correlation between the stanines and the grades received by the students in Algebra and General Mathematics. The writer has presented a series of scattergrams to assist in showing the coefficient of correlation. The scattergram provides at a glance an approximate correlation without the statistical computation.

Expectancy tables were constructed to show the predictive value of the best predictor of grades in Algebra and General Mathematics. These tables provide the administrator with predictive information concerning the placement of groups of students in designated courses. The administrator would be able to do this with a certain degree of confidence that most of the students would be placed correctly. The counselor could also, with some degree of accuracy, predict the grades which individual students would receive at the end of each semester of ninth - grade work.

CHAPTER II

REVIEW OF THE LITERATURE

Only a small amount of research information was found which related to the problem of this study, the use of test results to predict future success in high school. This chapter will present of review of the four aforementioned tests and a review of the results of similar studies.

Predictive validity is the ability of an instrument to predict some future event or events, as for example, grade point averages of a group of high school seniors after one year of college. Predictive validity is usually obtained by computing the correlation coefficient between a distribution of test scores obtained at an earlier time against a distribution of scores on some later criterion measure.[1]

An evaluation instrument possesses predictive validity to the degree that predictions of future pupil behavior made on the basis of the instrument are found to be accurate. If it is the purpose of an instrument to reveal future behavior, such as academic success, vocational success, or acceptable personal - social adjustment, predictive validity must then be characteristic of this instrument. The fact

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[1]Donald H. Blocher, Developmental Counseling (New York: The Ronald Press Company, 1966), p. 136.

that aptitude tests are designed to predict what a pupil can accomplish with training is another way of saying that aptitude tests, by definition, are fundamentally dependent upon the establishment of predictive validity. The use of scholastic aptitude scores for sectioning classes illustrate the utilization of a test score for the purpose of inferring tomorrow's successes and failures.[1]

The determination of the degree of predictive validity can be conveniently treated by using aptitude tests as illustrations. The practical value of tests designed to measure scholastic aptitude is centered in the accuracy with which a teacher can make predictions on the basis of their scores. It is logical, then, to take a longitudinal approach to the problem of determining degrees of predictive validity. A scholastic aptitude test can be administered to a group of pupils today and predictions of academic achievement can be made in one or more subjects to be studied by the pupil at some later time. At that time measurement of actual academic success can be made by means of achievement tests or possibly final marks. Finally, predicted achievement can be compared with actual achievement, and the pre-

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[1]J. Stanley Ahmann and Marvin D. Glock, Evaluating Pupil Growth (Boston: Allyn and Bacon, Inc., 1963), p. 295.

dictive validity in these prediction situations can be evaluated.[1]

Prediction is akin to placement in that it seeks, from a measure of present performance, a clue to future achievement. In fact, placement may be regarded as a special case of prediction - a case where there is a clear-cut dependence of future learnings on previous ones. In placement we are generally trying to specify differences in level of performance within a given subject area - e.g., should this pupil go into general mathematics or algebra?[2]

At the high-school level, fairly satisfactory predictions of academic success in particular areas can be made from tests designed to predict success in those areas.[3]

The primary source of information for most teachers as they investigate the predictive validity of standardized aptitude tests and personal - social adjustment inventories is the test manual.[4]

The principle ends to be sought of the CAAT are that the boy or girl incapable of profiting from the study of algebra may be spared the disheartening waste of time and

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[1] Ibid., p. 304.

[2] Educational Testing Service, op. cit., p. 19.

[3] Robert M. W. Travers, The Measurement of Student Adjustment and Achievement (Ann Arbor: University of Michigan Press, 1949), p. 176.

[4] Ahmann and Glock, op. cit., p. 311.

effort and may be led to direct his or her energies more advantageously to a general mathematics course and that the pupils of superior aptitude for mathematics be placed in ability sections for more intensive instructions.[1]

The 1958 edition of the CAAT consists of the following three sections:

I. Part I - Problems. Parallels situations which the pupil will face in solving verbal problems in algebra. Distance problems, work problems, and money problems are among those represented. Highest possible score is 48 points.
II. Part II - Formulas. Tests ingenuity in interpreting algebraic symbols. Memory is involved here to about the extent that it enters into success in algebra itself. Highest possible score is 28 points.
III. Part III - Number Series. Measures the ability to perceive abstract numerical relations. Highest possible score is 16 points.[2]

The entire test consists of 92 points. The CAAT may be administered in a one - hour testing period. This provides for fifty minutes actual working time and ten minutes for directions.[3]

The authors of this test do not attempt to select a score below which a given boy or girl should be counseled against attempting algebra. This is partly a question of the standard of instruction in the particular school concerned. Clearly for intelligent use to be made of aptitude

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[1] Keys and McCrum, op. cit., p. 2.

[2] Ibid.

[3] Ibid., p. 1.

scores, information is needed as to the average and range of algebraic ability in this particular situation. To this end, teachers and counselors will wish to accumulate records of the scores made by entering groups in successive years. By comparing these with the degree of success attained in the ninth grade work, aptitude norms appropriate for that school can be determined.[1]

CAAT provided the results of a study of sixteen classes in Indiana and California who took the CAAT at the beginning of ninth-grade algebra. As a measure of achievement, the Columbia Research Bureau Algebra Test was administered to twelve classes at the end of the first semester and to ten classes at the end of the year. Six classes took the test at the end of both semesters. The results of this study are presented in Table I.[2]

The validity coefficients of CAAT indicated that the test results can aid materially in determining whether individuals should spend time on regular algebra and in classifying pupils in algebra for instructional purposes. The coefficients were obtained by finding correlation coefficients between the aptitude test scores and scores on the Columbia Research Bureau Algebra Test.[3]

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[1] Ibid., p. 3.

[2] Ibid.

[3] David Segel, Mental Measurements Yearbook (third edition; Highland Park, New Jersey: The Gryphon Press, 1947), p. 411.

TABLE I

CORRELATION BETWEEN CAAT AND ACHIEVEMENT IN NINTH - GRADE ALGEBRA AS MEASURED BY THE COLUMBIA RESEARCH BUREAU ALGEBRA TEST

Scores Correlated	Number of Class Groups	Range of r's	Average r
CAAT and First Semester Achievement	12	.62 to .84	.77 ± .01
CAAT and Full Year Achievement	10	.54 to .85	.76 ± .02
Achievement at Ends of First and Second Semester	6	.60 to .82	.78 ± .02

A large part of CAAT was found to consist of the type of problem so frequently encountered in uninspired algebra teaching. William Mollenkopf believed the section on formulas emphasizes memory. The validity data cited for the test are seemingly impressive but must be evaluated in terms of their age. Local norms must be developed if the test is to be of full value to the counselor.[1]

The DAT is one of the most promising battery of aptitude tests that is currently available. The authors received the American Personnel and Guidance Association's Research Award in 1951 for distinguished work in test construction

[1] William G. Mollenkopf, Mental Measurements Yearbook (fourth edition; Highland Park, New Jersey: The Gryphon Press, 1953), p. 494.

and publication. The test yields eight scores: verbal reasoning; numerical ability; abstract reasoning; space relations; mechanical reasoning; clerical speed and accuracy; language usage: sentences; and language usage: spelling. The various tests are available in separate booklets. The entire battery can be administered in two sessions of approximately two-and-a-quarter hours each or in six one-period-per-day sessions. The manual is a comprehensive publication; what data it does not include are available from the American Documentation Institute. The battery is suitable for use with high school students, and alternate forms are available.[1]

The two subtests of the DAT which this study was concerned with were the numerical ability and the numerical ability plus verbal reasoning. The DAT NA test is a measure of the student's ability to reason with numbers, to manipulate numerical relationships, and to deal intelligently with quantitative materials. Educationally it is important for prediction in such fields as mathematics, physics, chemistry, engineering, and other curricula in which quantitative thinking is essential.[2]

The DAT VR test is a measure of ability to understand

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[1] Clifford P. Froehlich and Kenneth B. Hoyt, Guidance Testing (Chicago: Science Research Associates, Inc., 1959), p. 120.

[2] Bennett, Seashore, and Wesman, op. cit., pp. 1-7.

concepts framed in words. It is aimed at the evaluation of the student's ability to abstract or generalize and to think constructively, rather than at simple fluency or vocabulary recognition. The DAT VR test may be expected to predict with reasonable accuracy success in fields where complex verbal relationships and concepts are important. Academic success in most fields would certainly come under that classification.[1]

The DAT NA+VR score is a combination of the DAT NA test and the DAT VR test. The DAT NA+VR score is a measure of general learning ability. It is a prediction of overall academic success.[2]

The DAT NA test consists of forty points with the exact testing time of thirty minutes. The DAT VR test consists of fifty points with the exact testing time of thirty minutes. The DAT NA+VR score consists of ninety points. Approximately fifteen minutes should be allotted for the directions for the two tests.[3]

In general, all of the DAT tests seem to be reasonably good predictors of success in academic subjects. The authors wisely point out that the real test of the validity of the battery is the experience that each school has with it.

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[1] Ibid., pp. 1-6.

[2] Ibid., pp. 1-5.

[3] Ibid., pp. 2-6.

Evidence of validity in selected school systems is reported in the manual. The manual also includes studies of the DAT's predictive value in certain college and occupational groups.[1]

The amount of validity data available on the DAT is overwhelming, including several thousand validity coefficients. Most of these data are concerned with predictive validity in terms of high school achievement and (to a more limited extent) college achievement. Many of the coefficients are high, even with intervals as long as three years between test and criterion data. The results are somewhat less encouraging with regard to differential prediction. Although, in general, verbal tests correlate more highly with English courses and numerical tests with mathematical courses, there is evidence of a large general factor underlying performance in all academic work. DAT VR, for example, gives high correlations with most courses.

It is chiefly for this reason that the DAT NA+VR was introduced as an index of scholastic aptitude. Being the sum of the raw scores on the DAT NA and DAT VR subtests, this index correlates in the .70's and .80's with composite criteria of academic achievement. Norms are provided for this index, which is one of the scores regularly included in

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[1] Froehlich and Hoyt, op. cit., p. 121.

the DAT profile.[1]

DAT provided the results of a study of twenty-six classes in numerous states who took the DAT in either the eighth or ninth grade. The reported course marks in either general mathematics or algebra were taken at the end of the tested school year. The results of this study are presented in Table II.[2]

The reviewer, Harold Bechtoldt, commends the authors of the DAT on their work to date, and recommends these tests to vocational counselors for use in educational guidance or educational research programs. The results of further work by the test authors on the problem of the criterion and on the problem of differential prediction of success in educational or vocational activities will be interesting. These results may indicate that the prediction (differential or simple) of the available criterion measures can be accomplished as well by composite scores based on two or three clusters or groupings on the eight tests as by the scores on the separate tests.[3]

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[1]Anne Anastasi, Psychological Testing (New York: The Macmillan Company, 1968), p. 340.

[2]Bennett, Seashore, and Wesman, op. cit., pp. 5-9.

[3]Harold Bechtoldt, Mental Measurements Yearbook (fourth edition; Highland Park, New Jersey: The Gryphon Press, 1953), p. 676.

TABLE II

VALIDITY COEFFICIENTS BETWEEN DAT NA AND DAT NA+VR SCORES AND COURSE GRADES IN MATHEMATICS - BOYS AND GIRLS

Mathematics and General Math	DAT Taken	Course Marks Reported		N	Coefficient of Correlation-Boys		N	Coefficient of Correlation-Girls	
	Date	Grade	Date	Boys	NA	NA+VR	Girls	NA	NA+VR
Tested in Grade 8									
Schenectady, N. Y.	9-62	8	6-63	51	.69	.61	58	.70	.76
Edgerton, Wisc.	9-62	8	2-63	71	.74	.74	73	.67	.71
Edgerton, Wisc.	9-62	8	6-63	71	.64	.66	73	.72	.77
Tulsa, Okla.- Sch. 1	10-62	8	1-63	45	.38	.48	47	.52	.56
Tulsa, Okla.- Sch. 1	10-62	8	6-63	45	.36	.51	47	.50	.59
Tulsa, Okla.- Sch. 2	10-62	8	1-63	49	.58	.46	31	.58	.61
Tulsa, Okla.- Sch. 2	10-62	8	6-63	49	.48	.55	31	.61	.69
Clairton, Pa.	10-62	8	6-63	111	.42	.48	97	.46	.46
Wakefield, R.D.	10-62	8	6-63	74	.77	.72	71	.75	.69
Reno, Nevada	10-62	8	6-63	106	.52	.51	98	.64	.68
Chattanooga, Tenn.	9-62	8	5-63	97	.51	.55	83	.46	.56
Sacramento, Calif.	9-62	8	6-63	62	.66	.63	68	.79	.76
Tested in Grade 9									
Edgerton, Wisc.	9-62	9	2-63	40	.32	.17	28	.37	.56

TABLE II (continued)

Mathematics and General Math	DAT Taken	Course Marks Reported		N	Coefficient of Correlation-Boys		N	Coefficient of Correlation-Girls	
	Date	Grade	Date	Boys	NA	NA+VR	Girls	NA	NA+VR
Edgerton, Wisc.	9-62	9	6-63	40	.28	.23	28	.33	.71
Clairton, Pa.	10-62	9	6-63	50	.72	.70	49	.73	.64
Wakefield, R.I.	10-62	9	6-63	27	.51	.38	30	.75	.66
Reno, Nevada	10-62	9	6-63	44	.39	.35	39	.39	.40
Chattanooga, Tenn.	10-62	9	5-63	33	.29	.31	48	.60	.66
Algebra Tested in Grade 9									
Edgerton, Wisc.	9-62	9	2-63	48	.27	.25	48	.47	.53
Edgerton, Wisc.	9-62	9	6-63	48	.25	.26	48	.53	.53
Tulsa, Okla.- Sch. 2	10-62	9	1-63	26	.58	.33	30	.33	.41
Tulsa, Okla.- Sch. 2	10-62	9	6-63	26	.38	.38	30	.30	.34
Clairton, Pa.	10-62	9	6-63	83	.39	.39	75	.44	.42
Wakefield, R. I.	10-62	9	6-63	59	.47	.63	51	.54	.59
Reno, Nevada	10-62	9	6-63	66	.62	.65	78	.63	.61
Chattanooga, Tenn.	10-62	9	5-63	30	.51	.58	32	.62	.66
Sacramento, Calif.	9-62	9	6-63	42	.53	.55	33	.21	.27

In summary, according to Ralph F. Berdie, the DAT has been carefully developed and standardized by competent authors who have done an exceptionally good job in making information about these tests available to the public. These tests have some validity in predicting success in high school courses, and some evidence has appeared concerning their validity in predicting vocational success. These tests are presented primarily for use with boys and girls in grades 8 through 12. Information concerning the relationships existing between these test scores and other types of psychologically meaningful data should be gathered as soon as possible.[1]

John B. Carroll also considers this test exceptionally valuable. He states that at present, that, considering the test themselves and all the supporting data, the DAT constitutes the best available foundation battery for measuring the chief intellectual abilities and learned skills which one needs to take into account in high school counseling.[2]

Another reviewer, Norman Frederiksen, says the tests are technically of very high quality, and there is ample evidence that they can be usefully employed in a wide

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[1] Ralph F. Berdie, Ibid., p. 679.

[2] John B. Carroll, Mental Measurements Yearbook (fifth edition; Highland Park, New Jersey: The Gryphon Press, 1959), p. 673.

variety of educational selection, placement, and guidance areas. This reviewer does not hesitate to recommend the DAT for use in testing programs at the secondary level.[1]

The ITED is a battery of tests designed as a comprehensive measure of achievement for grades 9 through 12. The nine objective tests included in the battery are: understanding of basic social concepts, general background in the natural sciences, correctness and appropriateness of expression, ability to do quantitative thinking, interpretation of reading materials in the social studies, interpretation of reading materials in the natural sciences, interpretation of literary materials, general vocabulary, and use of sources of information. The tests emphasize broad intellectual skills and interests and an understanding of and ability to use what is learned, rather than sheer knowledge of facts. Tests will be rented by the publisher; the rental fee covers scoring and preparation of individual student profiles. Each test is also available on a purchase basis as a separate booklet with hand-scoring answer pads or machine-scoring answer sheets.[2]

The ITED QT might more appropriately have been called a general mathematics test, but such a title might wrongly

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[1] Norman Frederiksen, Ibid., p. 675.

[2] Froehlich and Hoyt, op. cit., p. 155.

imply that the responsibility for a pupil's test performance rests solely with the teachers of mathematics or arithmetic. Actually, the abilities measured by ITED QT may be developed in conjunction with work in all areas of the elementary and secondary curriculum. In large measure the maintenance and development of mathematical skills are also a product of the pupil's out-of-school experiences. Perhaps the most important feature of ITED QT is the practical nature of the problems. In essence, the criterion applied in the selection of problem situations was that the typical man-on-the-street would readily agree that the majority of the problems represent practical ones which every high school graduate should be able to solve.[1]

The practical characteristics of the ITED QT enhance the test's value as a guidance tool for all teachers. They also increase its usefulness in curriculum evaluation. However, they do not detract at all from the test's effectiveness as a measure of general aptitude for mathematics, or as a background test for use with any high school mathematics course.[2]

The ITED QT test consists of fifty-three items with a time limit of sixty-five minutes. An adequate supply of

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[1] Blommers, op. cit., p. 18.

[2] Ibid., p. 1.

scratch paper should be made available to each student before the test is administered. Approximately ten minutes should be allotted for the directions for the test.[1]

Reviewers also speak highly of the ITED. Erie F. Gardner says that from the point of view of the technical aspects of test construction, the ITED constitute an excellent battery. The format, directions, scaling and item construction are well done. As measures of certain broad aspects of the pupil's educational development they are definitely superior tests. Their relative merit in comparison with other high school subject matter tests of achievement depend upon one's philosophy of testing.[2]

Stephen Wiseman wishes that a similar set of tests were available in England. Now that the separate booklet edition is available and hand scoring is possible, the teacher can, if he wishes, select from the battery those tests which he particularly needs. There is no doubt that by using them he can obtain evidence on progress, standards, and general educational development that would be difficult to obtain in other ways.[3]

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[1] Ibid., p. 4.

[2] Eric F. Gardner, Mental Measurements Yearbook (fourth edition; Highland Park, New Jersey: The Gryphon Press, 1953), p. 47.

[3] Stephen Wiseman, Mental Measurements Yearbook (fifth edition; Highland Park, New Jersey: The Gryphon Press, 1959), p. 39.

The ITED is excellent, according to J. Murray Lee. They measure some of the important objectives which all high schools are attempting to attain. A major use of the tests is to reveal the pattern of the individual student's development and to show growth in this development from year to year. A second major use is to provide the faculty with a more dependable and objective basis for evaluating important phases of the total educational offering of the school. J. Murray Lee commends Lindquist, his associates, and the publisher for the careful construction and standardization of the tests, the completeness of statistical data and reports of studies of the tests, the completeness of the analysis of results made available to the school and the individual pupil, and for providing a scoring and reporting service which relieves teachers of clerical work.[1]

The OQSMAT - Beta test is a revision of the Otis Self-Administering Tests of Mental Ability. The test has six forms, the last two forms being published in 1953. The items in the test are largely verbal in nature. Instructions to the examinee are printed in the test booklet, and the problem of administration is further simplified by using a time limit for only the total test. Scoring is either by hand or by machine depending on the forms used. Mental age

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[1] J. Murray Lee, Ibid., p. 38.

may be determined from age norms. Reliability of the Beta was determined by correlating odd versus even scores from Form A with those from Form B. Coefficients varied from 0.79 to 0.95 and from 0.65 to 0.98, respectively.[1]

It should be understood from the outset that it is not possible to measure mental ability directly. It is possible only to measure the effect mental ability has had in enabling the pupil to acquire certain knowledge and mental skill. Of course, the answering of some types of questions depends less upon schooling and more upon mental ability than the answering ofothers, and in making up the test the aim has been for the most part as possible to choose that kind of question which depends as little on schooling and as much as possible on thinking.[2]

The OQSMAT - Beta consists of eighty items with a thirty-minute time limit. Approximately five minutes should be allotted for directions. To find a pupil's "Beta IQ", proceed as follows: (1) Find the norm for the pupil's age from the Age Table. (2) Find the amount by which the pupil's score exceeds (or falls below) the norm for his age. Call this his "deviation of score". (3) Add the pupil's deviation of score to 100 (or subtract from 100 if the deviation is downward). The result is the pupil's "Beta

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[1] Ahmann and Glock, op. cit., p. 395.

[2] Otis, op. cit., p. 1.

IQ".[1]

F. Kuhlman has long contended that the range of abilities found in school children from grades 1 to 12 cannot be adequately measured by as few as three or four batteries that are brief enough for practical administrative purposes. When attempted, either the range of difficulty of test items is smaller than the existing range of abilities to be measured, or the number of test items is so small as to give a poor sampling of abilities at different levels, or there may be a compromise between these two faults. The Otis batteries represent such a compromise, but on the whole with more leanings toward small number of items than toward restricted range in difficulty of items.[2]

Alfred Yates agrees with Kuhlman that the evidence concerning the validity of the test for predictive purposes is somewhat slender. It is indeed doubtful whether, for the normal purposes of classification and guidance within a school, teachers are likely to find the tests more serviceable than measures of attainment and their own judgment of their pupil's progress. The tests are obviously serviceable instruments, however, for the purposes of coarse classification when this has to be carried out without access to rele-

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[1] Ibid., p. 5.

[2] F. Kuhlmann, The 1940 Mental Measurements Yearbook (Highland Park, New Jersey: The Gryphon Press, 1941), p. 236.

vant information about children's previous educational progress.[1]

The OQSMAT is one of the oldest mental ability tests and has remained essentially unchanged since 1920. The .97 correlation has not been checked since 1918, and there has been no recent checks on norm correlation. Welty Lefever considers that at the present the OQSMAT is antiquated and inadequate. The OQSMAT should be honored as a milestone in the history of aptitude measurement but he wishes it were thoroughly up-dated and refined.[2]

There have been some studies done concerning the predictive validity of some standardized tests with grades in ninth - grade subjects. The Closed High School Placement Test, published by the Scholastic Testing Service, was administered to four small rural high schools in the State of Iowa in September, 1961. The first - semester grade-point average for each student was obtained five months later and the test scores were then correlated with grade averages separately for each high school. The results were as follows:

School A (N=56) Battery Composite Correlation .85
School B (N=35) Battery Composite Correlation .84

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[1] Alfred Yates, Mental Measurements Yearbook (fifth edition; Highland Park, New Jersey: The Gryphon Press, 1959), p. 500.

[2] Welty Lefever, Ibid., p. 497.

School C (N=63) Battery Composite Correlation .83
School D (N=24) Battery Composite Correlation .83[1]

In all four schools the battery composite score provided the best prediction of success in the first semester of ninth-grade programs. The study shows clearly that all of the HSPT scores provide useful information for classifying incoming ninth-grade students.

A similar study of the 1962 HSPT was conducted in a large surburban high school in Chicago, Illinois. In this study, also, the STS HSPT was given to incoming ninth-graders in September and first - semester grade-point averages were obtained five months later. The results show a positive correlation of .70 with the battery composite of HSPT.[2]

STS provided the results of a study of 180 students in Washington State who took the STS HSPT at the end of eighth grade and obtained the course grades (Algebra, English, Latin, and History) for the same students at the end of ninth grade. The results of this study are presented in Table III.

The Psychological Corporation has conducted a similar study with the use of the Academic Promise Tests. The study

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[1] Scholastic Testing Service, Inc., Technical Report, 1963 (Bensenville, Illinois: Scholastic Testing Service, Inc., 1963), p. 16.

[2] Ibid., p. 17.

TABLE III

CORRELATION BETWEEN END-OF-EIGHTH-GRADE STS HSPT SCORES AND END-OF-NINTH-GRADE COURSE GRADES OF 180 STUDENTS IN WASHINGTON STATE

HSPT	Algebra	Latin	History	English
Verbal Ability	.55	.42	.54	.48
Quantitative Ability	.53	.44	.48	.52
Total Ability	.63	.45	.57	.51
Arithmetic	.56	.53	.61	.57
Language	.54	.48	.52	.49
Reading	.45	.29	.39	.44
Composite	.64	.49	.59	.53

consisted of the correlation between Academic Promise Test scores and grades received by the same students at the end of ninth grade. The study included the four major subject areas: English, mathematics, science, and social studies. The results of this study are as follows:

APT scores and English Grades = .56
APT scores and Mathematics Grades = .52
APT scores and Science Grades = .58
APT scores and Social Studies Grades = .55[1]

The results of the APT were presented in seven areas and the

[1]The Psychological Corporation, Test Service Bulletin No. 55, A Bulletin Prepared by the Test Division (New York: The Psychological Corporation, 1963), p. 10.

above study included all the results. It was then concluded that the total scores provided the best measure by which to make predictions in the four mentioned subjects.[1]

There have been a few studies completed by Science Research Associates relating the use of the SRA Achievement Series as a predictor of success in ninth-grade subjects. In a study conducted at Carl Sandburg High School, Orland Park, Illinois, the 6-9 battery of the SRA Achievement Series was administered to 214 eighth-grade pupils in May, 1956. The grade-point averages of these pupils were calculated at the end of one semester in ninth grade. Correlations between series average grade equivalent scores in each of the four curriculum areas and grade-point averages were as follows:

Work - Study Skills	.66
Reading	.60
Language Arts	.69
Arithmetic	.66
Composite	.72[2]

The composite score on the SRA Achievement Series proved to be the best predictor for average grade-point at the end of one semester of ninth grade.[3]

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[1] Ibid., p. 11.

[2] Science Research Associates, Technical Report, 1957, A Pamphlet Explaining the SRA Achievement Series Test (Chicago: Science Research Associates, 1957), p. 33.

[3] Ibid.

In a similar study, the 6-9 battery was administered to all eighth-grade pupils in Elgin, Illinois in April, 1956. These scores were correlated with grade averages reported at the end of the freshman year in high school. These validities represent prediction over a thirteen-month period. The validity coefficients obtained are reported in Table IV.

TABLE IV

CORRELATION BETWEEN SRA ACHIEVEMENT SERIES RESULTS AND NINTH-YEAR GRADES IN ELGIN JUNIOR HIGH SCHOOL, ELGIN, ILLINOIS

Test	English N=467	General Mathematics N=179	Algebra N=295	General Science N=392	Science N=96
Work - Study Skills	.62	.37	.44	.68	.65
Reading	.63	.27	.37	.66	.68
Language Arts	.70	.32	.50	.65	.73
Arithmetic	.65	.48	.58	.70	.67
Composite	.73	.44	.58	.75	.76

NOTE: This table presents the results of the 6-9 battery given at the end of the eighth grade.

On the basis of the studies reported, it is quite evident that prediction of high school success from the use of standardized test results has been satisfactory. The high school counselor can find such results very helpful in

advising students concerning the selection of course of study, placement of students, and screening out students who need special remedial work.[1]

[1] Ibid.

CHAPTER III

RESULTS OF THE STUDY

The findings of this study are the results of the correlation study based on local norms of the CAAT, DAT NA, DAT NA+VR, ITED QT, and OQSMAT Beta for the two subject areas -- algebra and general mathematics. The statistical calculations of the coefficient of correlation are presented in the Appendix of this report.

The Pearson Product - Moment Formula was used to compute the coefficient of correlation between the scores on the CAAT, the DAT NA, the DAT NA+VR, the ITED QT, and the OQSMAT Beta and the grades students received at the end of each semester in ninth grade in algebra and general mathematics. The permanent records were examined for the student's test scores and grades for the 1968-1969 school year. The results of the coefficients of correlation arrived at are as follows:

	Algebra N=20		General Mathematics N=9	
	First Semester	Second Semester	First Semester	Second Semester
CAAT	.95	.86	.88	.55
DAT NA	.80	.77	.71	.40
DAT NA+VR	.63	.71	.77	.46
ITED QT	.18	.19	-.03	.00
OQSMAT Beta	.25	.31	.42	.09

The coefficients of correlation between teacher grades in algebra and CAAT scores were .95 and .86, which were the highest coefficients in each semester of algebra in the 1968-1969 school year. The coefficients of correlation between teacher grades in general mathematics and CAAT scores were .88 and .55, which were the highest coefficients in each semester of general mathematics in the 1968-1969 school year.

The mean correlations for each test and their subsequent semesters in algebra and general mathematics were computed. The writer checked the correlation for each test and for each semester grade in algebra and general mathematics and found that the mean correlation for CAAT was .81, for DAT NA .67, for DAT NA+VR .64, for ITED QT .09, and for OQSMAT Beta .27.

All the results from the one-year period were combined and coefficients of correlation were found for each test and each subject area on the basis of local norms. It was discovered that the coefficient of correlation range in algebra was from a high in CAAT of .95 to a low in ITED QT of .18. The coefficient of correlation range in general mathematics was from a high in CAAT of .88 to a low in ITED QT of -.03.

An expectancy table was developed as a predictive tool for administrators and counselors. The tables indicate

the probability of earning various grades in algebra and general mathematics as indicated from the composite score of the CAAT.

Some interesting observations were made from the expectancy tables. The first one was made in the area of algebra, with the results presented in Table V. A student in Stanine 9 of the CAAT received a grade of A, 75 per cent of the time and a grade of B, 25 per cent of the time. It was discovered that no student below Stanine 7 received a grade of A. It was noted that 100 per cent of the students in the stanine range of 1 through 5 received no grade higher than a C. An interesting observation was made from the group in Stanine 6. Of this group, no one received a grade of A or F, but 75 per cent of that group received a grade of C.

The expectancy table for general mathematics is presented as Table VI. None of the students in general mathematics scored above Stanine 4 in the CAAT. It was noted that no one in general mathematics received a grade of F and only 50 per cent of the students in Stanine 1 received a grade of D. The only grades of A were received by those students in Stanine 3 or 4.

The index of forecasting efficiency was used to compute the probable accuracy of prediction for the coefficients of correlation arrived at when grades were correlated

TABLE V

EXPECTANCY TABLE FOR PREDICTING SUCCESS IN ALGEBRA FROM THE COMPOSITE SCORE ON THE CAAT OF THE STUDENTS IN THE UNION - WHITTEN COMMUNITY SCHOOL

Stanine	Grade F		Grade D		Grade C		Grade B		Grade A	
	f*	Per cent	f	per cent	f	per cent	f	per cent	f	per cent
9	0	0	0	0	0	0	1	25	3	75
8	0	0	0	0	4	40	3	30	3	30
7	0	0	2	20	2	20	2	20	4	40
6	0	0	1	12.5	6	75	1	12.5	0	0
5	2	100	0	0	0	0	0	0	0	0
4	1	25	1	25	2	50	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
2	2	100	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0

*Frequency

with composite scores of the CAAT, the DAT NA, the DAT NA+VR, the ITED QT, and the OQSMAT Beta. This index indicates the percentage improvement in predictive ability of a coefficient of correlation over pure chance. The efficiency index was found to be 41 per cent for the CAAT, 26 per cent for the DAT NA, 23 per cent for the DAT NA+VR, 1 per cent for the ITED QT, and 4 per cent for the OQSMAT Beta.

TABLE VI

EXPECTANCY TABLE FOR PREDICTING SUCCESS IN GENERAL MATHEMATICS FROM THE COMPOSITE SCORE ON THE CAAT OF THE STUDENTS IN THE UNION - WHITTEN COMMUNITY SCHOOL

Stanine	Grade F		Grade D		Grade C		Grade B		Grade A	
	f*	per cent	f	per cent	f	per cent	f	per cent	f	per cent
9	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	1	50	0	0	1	50
3	0	0	0	0	1	25	1	25	2	50
2	0	0	0	0	4	67	2	33	0	0
1	0	0	3	50	3	50	0	0	0	0

*Frequency

This would mean that when predicting individual performance in algebra and general mathematics by the CAAT the efficiency index would enable one to predict with 41 per cent greater accuracy than by pure chance. As an example of this, if predictions made by chance were successful fifty times in one hundred cases, prediction made by using the composite score on the CAAT would be expected to be success-

ful approximately seventy or seventy-one times out of one hundred cases. This example is for the CAAT. On the same basis, the DAT NA prediction would be expected to be successful about sixty-three times out of one hundred cases. In the DAT NA+VR, one would expect to be able to predict successfully approximately 61 or 62 per cent of the time. The ITED QT prediction would be expected to be successful approximately fifty or fifty-one times out of one hundred cases. In the OQSMAT Beta, one would expect to predict successfully about 52 per cent of the time.

CHAPTER IV

SUMMARY AND CONCLUSIONS

I. SUMMARY

The purpose of this study was (1) to evaluate the California Algebra Aptitude Test, the Differential Aptitude Test, the Iowa Test of Educational Development, and the Otis Quick - Scoring Mental Ability Test as to which test is the best measure to predict success in ninth-grade mathematics; (2) to check the correlations of these test scores with students' grades at the end of each semester in ninth-grade mathematics in the Union - Whitten Community School, Union, Iowa, for the 1968-1969 school year; and (3) to use these results for future placement in ninth-grade mathematics.

The writer first determined the correlation between the CAAT score, the DAT NA score, the DAT NA+VR score, the ITED QT score, and the OQSMAT Beta score and grades received at the end of each semester of ninth grade in Algebra I and General Mathematics. The mean correlations for each test and their subsequent semesters in Algebra I and General Mathematics were as follows: CAAT +.81, DAT NA +.67, DAT NA+VR +.64, ITED QT +.09, and OQSMAT Beta +.27. The coefficient of correlation range in Algebra I was from a high of .95 in CAAT to a low of .18 in ITED QT. The coefficient of correlation range in General Mathematics was from a high of

.88 in CAAT to a low of -.03 in ITED QT.

To interpret these results further, the mean coefficients of correlation of these five tests were placed on a scale ranging from a very high relationship to an indifferent relationship. The mean coefficient of correlation of the CAAT (+.81) in this study was found to denote a high degree. The mean coefficients of correlation of the DAT NA (+.67) and the DAT NA+VR (+.64) in this study were found to denote a substantial or marked relationship. The mean coefficient of correlation of the OQSMAT Beta (+.27) denoted a low correlation present. The mean coefficient of correlation of the ITED QT (+.09) was found to denote an indifferent relationship. Garrett evaluated coefficients of correlation as follows:

r from .00 to + .20 denotes indifferent relationship
r from ± .20 to ± .40 denotes low correlation present
r from ± .40 to ± .70 denotes substantial or marked relationship
r from + .70 to ± 1.00 denotes high to very high relationship[1]

II. CONCLUSIONS

Based on the results of this study, the writer concludes that the CAAT was the best predictor of success in ninth-grade mathematics at the Union - Whitten Community

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[1] Henry E. Garrett, Statistics in Psychology and Education (New York: Longman's Green and Company, 1958), p. 176.

School. At Union - Whitten, the placement scores should be further studied over a long period of time involving a larger number of students.

The expectancy tables of CAAT scores and grades in Algebra I and General Mathematics will be more beneficial with the addition of more tested students. The writer reviewed the data presented in Tables V and VI and found the following conclusions:

1. None of the students in Stanines 6, 7, 8, and 9 received a grade of F in Algebra I.
2. Sixty-two per cent of the students in Stanines 1, 2, 3, 4, and 5 received a grade of F in Algebra I.
3. Fifty per cent of the students receiving a grade of C in Algebra I were in Stanine 6.
4. None of the students in General Mathematics scored above Stanine 4.
5. None of the students in General Mathematics received a grade of F.

The efficiency index figures of this study were found to be 41 per cent for the CAAT, 26 per cent for the DAT NA, 23 per cent for the DAT NA+VR, 4 per cent for the OQSMAT Beta, and 1 per cent for the ITED QT. This information further led the writer to conclude that the CAAT was the best predictor of success in ninth-grade mathematics.

The mean coefficient of correlation of the CAAT was

found to be in the very high range of ± .70 to ± 1.00. These data would warrant the continued use of the CAAT as an instrument for the prediction of ninth-grade success in Algebra I and General Mathematics. The mean coefficients of correlation of the DAT NA and the DAT NA+VR denote a substantial or marked relationship. The data on the DAT indicated that the DAT was beneficial for testing aptitudes in high school students. The use of the DAT would assist the high school counselor in his counseling with the students. The mean coefficient of correlation of the OQSMAT Beta denoted a low correlation present. The writer concluded that the OQSMAT may be outdated and that serious consideration should be made concerning the replacing of the OQSMAT with a more accurate intelligence test. The mean coefficient of correlation of the ITED QT was found to denote an indifferent relationship. The writer concluded that although the ITED is a well-written, valid series of achievement tests, its ability to predict success in ninth-grade mathematics is not very apparent. The ITED should be evaluated quite extensively to ascertain if it is very beneficial to the counseling program.

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APPENDIXES

APPENDIX A

CORRELATION BETWEEN CAAT COMPOSITE SCORES AND GRADES RECEIVED IN ALGEBRA AT THE END OF THE FIRST SEMESTER OF NINTH GRADE IN THE YEAR 1969

Stanine	Grades 0	1	2	3	4	fy	dy	fdy	fd^2y	dx	dxdy
9	0	0	0	0	2	2	2.4	4.8	11.52	2.8	6.72
8	0	0	1	2	2	5	1.4	7.0	9.80	3.0	4.20
7	0	0	2	0	3	5	.4	2.0	.80	3.0	1.20
6	0	0	3	1	0	4	-.6	-2.4	1.44	-1.4	.84
5	1	0	0	0	0	1	-1.6	-1.6	2.56	-2.6	4.16
4	0	1	1	0	0	2	-2.6	-5.2	13.52	-2.2	5.72
3	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	1	-4.6	-4.6	21.16	-2.6	11.96
1	0	0	0	0	0	0	0	0	0	0	0
fx	2	1	7	3	7	20	-5.2	0	60.80	0	34.80
dx	-2.6	-1.6	-.6	.4	1.4	-3					
fdx	-5.2	-1.6	-4.2	1.	9.8	0					
fd^2x	13.52	2.56	2.52	.48	13.72	32.80					

Coefficient of Correlation = .95

APPENDIX B

CORRELATION BETWEEN CAAT COMPOSITE SCORES AND GRADES RECEIVED IN ALGEBRA AT THE END OF THE SECOND SEMESTER OF NINTH GRADE IN THE YEAR 1969

Stanine	Grades 0	1	2	3	4	fy	dy	fdy	fd^2y	dx	dxdy
9	0	0	0	1	1	2	2.4	4.8	11.52	2.90	6.96
8	0	0	3	1	1	5	1.4	7.0	9.80	2.75	3.85
7	0	2	0	2	1	5	.4	2.0	.80	1.75	.70
6	0	1	3	0	0	4	-.6	-2.4	1.44	-1.20	.72
5	1	0	0	0	0	1	-1.6	-1.6	2.56	-2.05	3.28
4	1	0	1	0	0	2	-2.6	-5.2	13.52	-2.10	5.46
3	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	1	-4.6	-4.6	21.16	-2.05	9.43
1	0	0	0	0	0	0	0	0	0	0	0
fx	3	3	7	4	3	20	-5.2	0	60.80	0	30.40
dx	-2.05	-1.05	-.05	.95	1.95	-.25					
fdx	-6.15	-3.15	-.35	3.80	5.85	0					
fd^2x	12.6075	3.3075	.0175	3.61	11.4075	30.95					

Coefficient of Correlation = .86

APPENDIX C

CORRELATION BETWEEN DAT NA COMPOSITE SCORES AND GRADES RECEIVED IN ALGEBRA AT THE END OF THE FIRST SEMESTER OF NINTH GRADE IN THE YEAR 1969

Stanine	Grades 0	1	2	3	4	fy	dy	fdy	fd^2y	dx	dxdy
9	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	3	3	1.9	5.7	10.83	4.2	7.98
7	0	0	3	1	3	7	.9	6.3	5.67	2.8	2.52
6	0	0	1	1	1	3	-.1	-.3	.03	1.2	-.12
5	0	0	3	1	0	4	-1.1	-4.4	4.84	-1.4	1.54
4	1	1	0	0	0	2	-2.1	-4.2	8.82	-4.2	8.82
3	1	0	0	0	0	1	-3.1	-3.1	9.61	-2.6	8.06
2	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0
fx	2	1	7	3	7	20	-3.6	0	39.80	0	28.80
dx	-2.6	-1.6	-.6	.4	1.4	-3					
fdx	-5.2	-1.6	-4.2	1.2	9.8	0					
fd^2x	13.52	2.56	2.52	.48	13.72	32.80					

Coefficient of Correlation = .80

APPENDIX D

CORRELATION BETWEEN DAT NA COMPOSITE SCORES AND GRADES RECEIVED IN ALGEBRA AT THE END OF THE SECOND SEMESTER OF NINTH GRADE IN THE YEAR 1969

Stanine	Grades 0	1	2	3	4	fy	dy	fdy	fd^2y	dx	dxdy
9	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	1	2	3	1.9	5.7	10.83	4.85	9.215
7	0	2	2	2	1	7	.9	6.3	5.67	1.65	1.485
6	0	0	2	1	0	3	-.1	-.3	.03	.85	-.085
5	0	1	3	0	0	4	-1.1	-4.4	4.84	-1.20	1.320
4	2	0	0	0	0	2	-2.1	-4.2	8.82	-4.10	8.610
3	1	0	0	0	0	1	-3.1	-3.1	9.61	-2.05	6.355
2	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0
fx	3	3	7	4	3	20	-3.6	0	39.80	0	26.90
dx	-2.05	-1.05	-.05	.95	1.95	-.25					
fdx	-6.15	-3.15	-.35	3.80	5.85	0					
fd^2x	12.6075	3.3075	.0175	3.61	11.4075	30.95					

Coefficient of Correlation = .77

APPENDIX E

CORRELATION BETWEEN DAT NA+VR COMPOSITE SCORES AND GRADES RECEIVED IN ALGEBRA AT THE END OF THE FIRST SEMESTER OF NINTH GRADE IN THE YEAR 1969

Stanine	Grades 0	1	2	3	4	fy	dy	fdy	fd^2y	dx	dxdy
9	0	0	0	0	1	1	2.55	2.55	6.5025	1.4	3.570
8	0	0	0	0	4	4	1.55	6.20	9.6100	5.6	8.680
7	1	0	1	1	1	4	.55	2.20	1.2100	-1.4	-.770
6	0	0	4	2	0	6	-.45	-2.70	1.2150	-1.6	.720
5	0	1	2	0	1	4	-1.45	-5.80	8.4100	-1.4	2.030
4	1	0	0	0	0	1	-2.45	-2.45	6.0025	-2.6	6.370
3	0	0	0	0	0	0	0	0	0	00	0
2	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0
fx	2	1	7	3	7	20	.30	0	32.95	0	20.60
dx	-2.6	-1.6	-.6	.4	1.4	-3					
fdx	-5.2	-1.6	-4.2	1.2	9.8	0					
d^2x	13.52	2.56	2.52	.48	13.72	32.80					

Coefficient of Correlation = .63

APPENDIX F

CORRELATION BETWEEN DAT NA+VR COMPOSITE SCORES AND GRADES RECEIVED IN ALGEBRA AT THE END OF THE SECOND SEMESTER OF NINTH GRADE IN THE YEAR 1969

	Grades										
tanine	0	1	2	3	4	fy	dy	fdy	fd^2y	dx	dxdy
9	0	0	0	0	1	1	2.55	2.55	6.5025	1.95	4.9725
8	0	0	0	2	2	4	1.55	6.20	9.6100	5.80	8.9900
7	1	0	2	1	0	4	.55	2.20	1.2100	-1.20	-.6600
6	0	2	4	0	0	6	-.45	-2.70	1.2150	-2.30	1.0350
5	1	1	1	1	0	4	-1.45	-5.80	8.4100	-2.20	3.1900
4	1	0	0	0	0	1	-2.45	-2.45	6.0025	-2.05	5.0225
3	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0
fx	3	3	7	4	3	20	.30	0	32.95	0	22.55
dx	-2.05	-1.05	-.05	.95	1.95	-.25					
fdx	-6.15	-3.15	-.35	3.80	5.85	0					
d^2x	12.6075	3.3075	.0175	3.61	11.4075	30.95					

Coefficient of Correlation = .71

APPENDIX G

CORRELATION BETWEEN ITED QT COMPOSITE SCORES AND GRADES RECEIVED IN ALGEBRA AT THE END OF THE FIRST SEMESTER OF NINTH GRADE IN THE YEAR 1969

tanine	Grades 0	1	2	3	4	fy	dy	fdy	fd^2y	dx	dxdy
9	1	0	0	0	3	4	2.65	10.60	28.090	1.6	4.24
8	0	0	1	1	2	4	1.65	6.60	10.890	2.6	4.29
7	0	0	2	1	0	3	.65	1.95	1.2675	-.8	-.52
6	0	1	0	1	0	2	-.35	-.70	.245	-1.2	.42
5	1	0	1	0	1	3	-1.35	-4.05	5.4675	-1.8	2.43
4	0	0	2	0	0	2	-2.35	-4.70	11.045	-1.2	2.82
3	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	1	1	-4.35	-4.35	18.9225	1.4	-6.09
1	0	0	1	0	0	1	-5.35	-5.35	28.6225	-.6	3.21
fx	2	1	7	3	7	20	-8.80	0	104.55	0	10.80
dx	-2.6	-1.6	-.6	.4	1.4	-3					
fdx	-5.2	-1.6	-4.2	1.2	9.8	0					
d^2x	13.52	2.56	2.52	.48	13.72	32.80					

Coefficient of Correlation = .18

APPENDIX H

CORRELATION BETWEEN ITED QT COMPOSITE SCORES AND GRADES RECEIVED IN ALGEBRA AT THE END OF THE SECOND SEMESTER OF NINTH GRADE IN THE YEAR 1969

Stanine	Grades 0	1	2	3	4	fy	dy	fdy	fd^2y	dx	dxdy
9	1	0	0	1	2	4	2.65	10.60	28.090	2.80	7.42
8	0	1	1	2	0	4	1.65	6.60	10.890	.80	1.32
7	0	0	3	0	0	3	.65	1.95	1.2675	-.15	-.0975
6	1	0	1	0	0	2	-.35	-.70	.245	-2.10	.7350
5	1	0	1	0	1	3	-1.35	-4.05	5.4675	-.15	.2025
4	0	2	0	0	0	2	-2.35	-4.70	11.045	-2.10	4.9350
3	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	1	0	1	-4.35	-4.35	18.9225	.95	-4.1325
1	0	0	1	0	0	1	-5.35	-5.35	28.6225	-.05	.2675
fx	3	3	7	4	3	20	-8.80	0	104.55	0	10.65
dx	-2.05	-1.05	-.05	.95	1.95	-.25					
fdx	-6.15	-3.15	-.35	3.80	5.85	0					
fd^2x	12.6075	3.3075	.0175	3.61	11.4075	30.95					

Coefficient of Correlation = .19

APPENDIX I

CORRELATION BETWEEN OQSMAT BETA COMPOSITE SCORES AND GRADES RECEIVED IN ALGEBRA AT THE END OF THE FIRST SEMESTER OF NINTH GRADE IN THE YEAR 1969

Stanine	Grades 0	1	2	3	4	fy	dy	fdy	fd^2y	fx	dxdy
9	0	0	0	0	0	0	0	0	0	0	0
8	1	0	2	0	1	4	1.25	5.00	6.2500	-2.4	-3.00
7	0	0	2	3	4	9	.25	2.25	.5625	5.6	1.40
6	0	1	3	0	2	6	-.75	-4.50	3.3750	-.6	.45
5	0	0	0	0	0	0	0	0	0	0	0
4	1	0	0	0	0	1	-2.75	-2.75	7.5625	-2.6	7.15
3	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0
fx	2	1	7	3	7	20	-2	0	17.75	0	6.00
dx	-2.6	-1.6	-.6	.4	1.4	-3					
fdx	-5.2	-1.6	-4.2	1.2	9.8	0					
fd^2x	13.52	2.56	2.52	.48	13.72	32.80					

Coefficient of Correlation = .25

APPENDIX J

CORRELATION BETWEEN OQSMAT BETA COMPOSITE SCORES AND GRADES RECEIVED IN ALGEBRA AT THE END OF THE SECOND SEMESTER OF NINTH GRADE IN THE YEAR 1969

Stanine	Grades 0	1	2	3	4	fy	dy	fdy	fd^2y	fx	dxdy
9	0	0	0	0	0	0	0	0	0	0	0
8	1	1	1	0	1	4	1.25	5.00	6.2500	-1.20	-1.5000
7	0	0	5	2	2	9	.25	2.25	.5625	5.55	1.3875
6	1	2	1	2	0	6	-.75	-4.50	3.3750	-2.30	1.7250
5	0	0	0	0	0	0	0	0	0	0	0
4	1	0	0	0	0	1	-2.75	-2.75	7.5625	-2.05	5.6375
3	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0
fx	3	3	7	4	3	20	-2	0	17.75	0	7.25
dx	-2.05	-1.05	-.05	.95	1.95	-.25					
fdx	-6.15	-3.15	-.35	3.80	5.85	0					
fd^2x	12.6075	3.3075	.0175	3.61	11.4075	30.95					

Coefficient of Correlation = .31

APPENDIX K

CORRELATION BETWEEN CAAT COMPOSITE SCORES AND GRADES RECEIVED IN GENERAL MATHEMATICS AT THE END OF THE FIRST SEMESTER OF NINTH GRADE IN THE YEAR 1969

Stanine	Grades 0	1	2	3	4	fy	dy	fdy	fd^2y	dx	dxdy
9	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	1	1	17/9	17/9	289/81	4/3	68/27
3	0	0	0	1	1	2	8/9	16/9	128/81	5/3	40/27
2	0	0	1	2	0	3	-1/9	-3/9	3/81	0	0
1	0	1	2	0	0	3	-10/9	-30/9	300/81	-9/3	90/27
fx	0	1	3	3	2	9	14/9	0	720/81	0	198/27
dx	0	-5/3	-2/3	1/3	4/3	-2/3					
fdx	0	-5/3	-6/3	3/3	8/3	0					
fd^2x	0	25/9	12/9	3/9	32/9	72/9					

Coefficient of Correlation = .88

APPENDIX L

CORRELATION BETWEEN CAAT COMPOSITE SCORES AND GRADES RECEIVED IN GENERAL MATHEMATICS AT THE END OF THE SECOND SEMESTER OF NINTH GRADE IN THE YEAR 1969

tanine	Grades 0	1	2	3	4	fy	dy	fdy	fd^2y	dx	dxdy
9	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0
4	0	0	1	0	0	1	17/9	17/9	289/81	0	0
3	0	0	1	0	1	2	8/9	16/9	128/81	2	16/9
2	0	0	3	0	0	3	-1/9	-3/9	3/81	0	0
1	0	2	1	0	0	3	-10/9	-30/9	300/81	-2	20/9
fx	0	2	6	0	1	9	14/9	0	720/81	0	36/9
dx	0	-1	0	0	2	1					
fdx	0	-2	0	0	2	0					
fd^2x	0	2	0	0	4	6					

Coefficient of Correlation = .55

APPENDIX M

CORRELATION BETWEEN DAT NA COMPOSITE SCORES AND GRADES RECEIVED IN GENERAL MATHEMATICS AT THE END OF THE FIRST SEMESTER OF NINTH GRADE IN THE YEAR 1969

	Grades										
tanine	0	1	2	3	4	fy	dy	fdy	fd^2y	dx	dxdy
9	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0
4	0	0	1	1	2	4	+2/3	8/3	16/9	7/3	14/9
3	0	0	2	2	0	4	-1/3	-4/3	4/9	-2/3	2/9
2	0	1	0	0	0	1	-4/3	-4/3	16/9	-5/3	20/9
1	0	0	0	0	0	0	0	0	0	0	0
fx	0	1	3	3	2	9	-1	0	36/9	0	36/9
dx	0	-5/3	-2/3	+1/3	+4/3	-2/3					
fdx	0	-5/3	-6/3	+3/3	+8/3	0					
d^2x	0	25/9	12/9	3/9	32/9	72/9					

Coefficient of Correlation = .71

APPENDIX N

CORRELATION BETWEEN DAT NA COMPOSITE SCORES AND GRADES RECEIVED IN GENERAL MATHEMATICS AT THE END OF THE SECOND SEMESTER OF NINTH GRADE IN THE YEAR 1969

Stanine	Grades 0	1	2	3	4	fy	dy	fdy	fd^2y	dx	dxdy
9	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0
4	0	1	2	0	1	4	+2/3	8/3	16/9	1	+2/3
3	0	0	4	0	0	4	-1/3	-4/3	4/9	0	0
2	0	1	0	0	0	1	-4/3	-4/3	16/9	-1	+4/3
1	0	0	0	0	0	0	0	0	0	0	0
fx	0	2	6	0	1	9	-1	0	36/9	0	6/3
dx	0	-1	0	0	2	1					
fdx	0	-2	0	0	2	0					
fd^2x	0	2	0	0	4	6					

Coefficient of Correlation = .40

APPENDIX O

CORRELATION BETWEEN DAT NA+VR COMPOSITE SCORES AND GRADES RECEIVED IN GENERAL MATHEMATICS AT THE END OF THE FIRST SEMESTER OF NINTH GRADE IN THE YEAR 1969

	Grades										
tanine	0	1	2	3	4	fy	dy	fdy	fd^2y	dx	dxdy
9	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	1	1	22/9	22/9	484/81	4/3	88/27
5	0	0	0	0	1	1	13/9	13/9	169/81	4/3	52/27
4	0	0	0	1	0	1	4/9	4/9	16/81	1/3	4/27
3	0	1	2	2	0	5	-5/9	-25/9	125/81	-7/3	35/27
2	0	0	1	0	0	1	-14/9	-14/9	196/81	-2/3	28/27
1	0	0	0	0	0	0	0	0	0	0	0
fx	0	1	3	3	2	9	20/9	0	990/81	0	207/27
dx	0	-5/3	-2/3	1/3	4/3	-2/3					
fdx	0	-5/3	-6/3	3/3	8/3	0					
d^2x	0	25/9	12/9	3/9	32/9	72/9					

Coefficient of Correlation = .77

APPENDIX P

CORRELATION BETWEEN DAT NA+VR COMPOSITE SCORES AND GRADES RECEIVED IN GENERAL MATHEMATICS AT THE END OF THE SECOND SEMESTER OF NINTH GRADE IN THE YEAR 1969

Stanine	Grades 0	1	2	3	4	fy	dy	fdy	fd^2y	dx	dxdy
9	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0
6	0	0	1	0	0	1	22/9	22/9	484/81	0	0
5	0	0	0	0	1	1	13/9	13/9	169/81	2	26/9
4	0	0	1	0	0	1	4/9	4/9	16/81	0	0
3	0	2	3	0	0	5	-5/9	-25/9	125/81	-2	10/9
2	0	1	1	0	0	1	-14/9	-14/9	196/81	0	0
1	0	0	0	0	0	0	0	0	0	0	0
fx	0	2	6	0	1	9	20/9	0	990/81	0	36/9
dx	0	-1	0	0	2	1					
fdx	0	-2	0	0	2	0					
fd^2x	0	2	0	0	4	6					

Coefficient of Correlation = .46

APPENDIX Q

CORRELATION BETWEEN ITED QT COMPOSITE SCORES AND GRADES RECEIVED IN GENERAL MATHEMATICS AT THE END OF THE FIRST SEMESTER OF NINTH GRADE IN THE YEAR 1969

Stanine	Grades 0	1	2	3	4	fy	dy	fdy	fd^2y	dx	dxdy
9	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	1	0	1	28/9	28/9	784/81	3/9	84/81
4	0	0	0	0	0	0	0	0	0	0	0
3	0	1	0	0	0	1	10/9	10/9	100/81	-15/9	-150/81
2	0	0	0	1	1	2	1/9	2/9	2/81	15/9	15/81
1	0	0	3	1	1	5	-8/9	-40/9	320/81	-3/9	+24/81
fx	0	1	3	3	2	9	31/9	0	1206/81	0	-27/81
dx	0	-15/9	-6/9	3/9	12/9	-6/9					
fdx	0	-15/9	-18/9	9/9	24/9	0					
fd^2x	0	225/81	108/81	27/81	288/81	648/81					

Coefficient of Correlation = -.03

APPENDIX R

CORRELATION BETWEEN ITED QT COMPOSITE SCORES AND GRADES RECEIVED IN GENERAL MATHEMATICS AT THE END OF THE SECOND SEMESTER OF NINTH GRADE IN THE YEAR 1969

Stanine	Grades 0	1	2	3	4	fy	dy	fdy	fd^2y	dx	dxdy
9	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0
5	0	0	1	0	0	1	28/9	28/9	784/81	0	0
4	0	0	0	0	0	0	0	0	0	0	0
3	0	1	0	0	0	1	10/9	10/9	100/81	-1	-10/9
2	0	0	1	0	1	2	1/9	2/9	2/81	2	2/9
1	0	1	4	0	0	5	-8/9	-40/9	320/81	-1	8/9
fx	0	2	6	0	1	9	31/9	0	1206/81	0	0
dx	0	-1	0	0	2	1					
fdx	0	-2	0	0	2	0					
fd^2x	0	2	0	0	4	6					

Coefficient of Correlation = .00

APPENDIX S

CORRELATION BETWEEN OQSMAT BETA COMPOSITE SCORES AND GRADES RECEIVED IN GENERAL MATHEMATICS AT THE END OF THE FIRST SEMESTER OF NINTH GRADE IN THE YEAR 1969

Stanine	Grades 0	1	2	3	4	fy	dy	fdy	fd^2y	dx	dxdy
9	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	1	1	23/9	23/9	529/81	4/3	92/27
6	0	0	1	1	0	2	14/9	28/9	392/81	-1/3	-14/27
5	0	0	0	0	0	0	0	0	0	0	0
4	0	1	0	2	1	4	-4/9	-16/9	64/81	1/3	-4/27
3	0	0	1	0	0	1	-13/9	-13/9	169/81	-2/3	26/27
2	0	0	1	0	0	1	-22/9	-22/9	484/81	-2/3	44/27
1	0	0	0	0	0	0	0	0	0	0	0
fx	0	1	3	3	2	9	-2/9	0	1638/81	0	144/27
dx	0	-5/3	-2/3	1/3	4/3	-2/3					
fdx	0	-5/3	-6/3	3/3	8/3	0					
fd^2x	0	25/9	12/9	3/9	32/9	72/9					

Coefficient of Correlation = .42

APPENDIX T

CORRELATION BETWEEN OQSMAT BETA COMPOSITE SCORES AND GRADES RECEIVED IN GENERAL MATHEMATICS AT THE END OF THE SECOND SEMESTER OF NINTH GRADE IN THE YEAR 1969

Stanine	Grades 0	1	2	3	4	fy	dy	fdy	fd^2y	dx	dxdy
9	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0
7	0	0	1	0	0	1	23/9	23/9	529/81	0	0
6	0	0	2	0	0	2	14/9	28/9	392/81	0	0
5	0	0	0	0	0	0	0	0	0	0	0
4	0	1	2	0	1	4	-4/9	-16/9	64/81	1	-4/9
3	0	1	0	0	0	1	-13/9	-13/9	169/81	-1	+13/9
2	0	0	1	0	0	1	-22/9	-22/9	484/81	0	0
1	0	0	0	0	0	0	0	0	0	0	0
fx	0	2	6	0	1	9	-2/9	0	1638/81	0	1
dx	0	-1	0	0	2	1					
fdx	0	-2	0	0	2	0					
fd^2x	0	2	0	0	4	6					

Coefficient of Correlation = .09